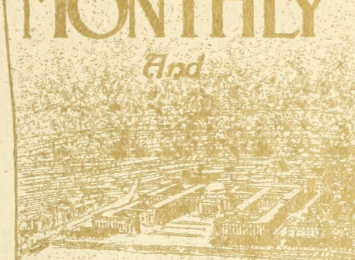
SPECIAL REUNION NUMBER

The TECHNOLOGY MONTHLY

And

HARVARD ENGINEERING JOURNAL



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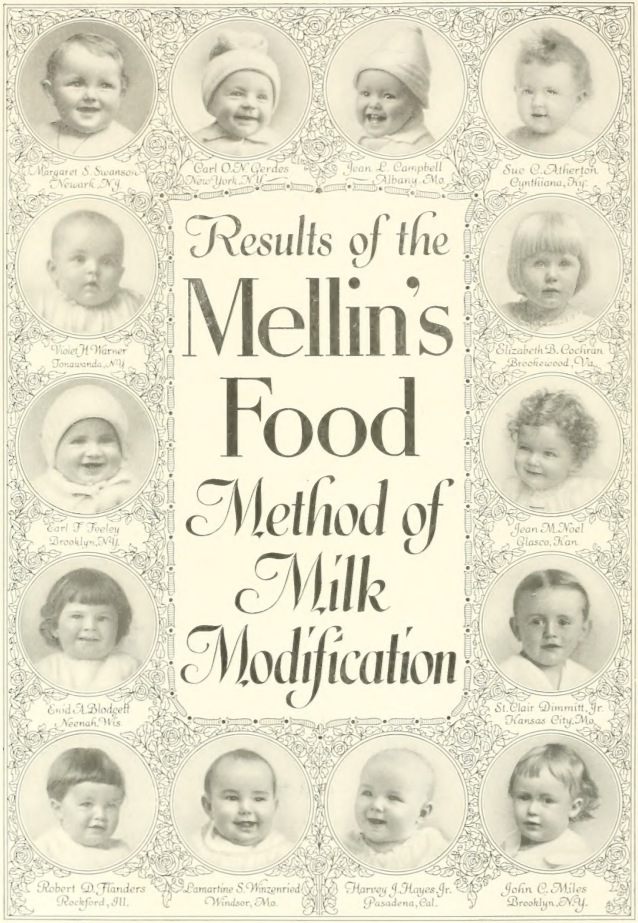
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The Technology Monthly
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The Beaver

By JAMES A. TOBEY, '15

"Wee, timorous, cow'ring beastie,"
So sang the bard of yore.
The bard is dead, the beast has fled;
Another minstrel has the floor.

His no song of a mammal great,
Nor yet of a microbe thin,
But rather the plaint of a rodent quaint,
With whiskers on his chin.

A most industrious beast is he,
Of great and glorious bent;
He seeks the night, the moon his light,
And all the world his tent.

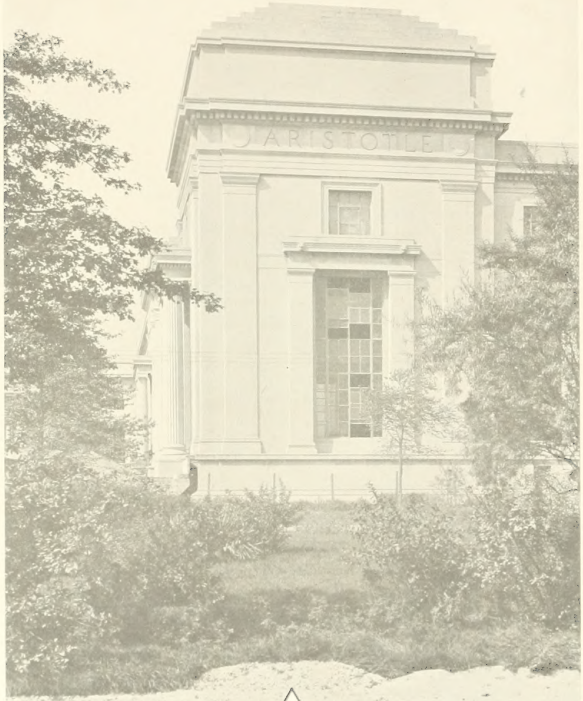
Unlike the men he represents,
His habits are aquatic,
And it is rare to hear him swear,
But his dam is most emphatic.

On bull-dog and tiger and kangaroo
Yon crimson flag has cast its blight,
But the beaver growls in his lower jowls,
And Harvard knows his bite.

On granite steps he now disports,
And his fur is all awry;
But a stately dome is his future home,
Where the river dances by.

And when he leaves the sombre steps
For a marble hall on another shore,
In a distant year he may shed a tear
And dream of the days before.

THE NEW TECHNOLOGY



THE TECHNOLOGY MONTHLY
AND HARVARD ENGINEERING JOURNAL

VOL. III BOSTON, MASS., JUNE, 1916 NO. 3

THE NEW INSTITUTE

By HAROLD E. KEBBON, M.I.T., '12
Supervising Architect of The New Technology

Editor's Note. There is scarcely any one better fitted to discuss the future of the New Institute than Mr. Kebbon, who through his intimate association with the work of the building and planning, has been able to imagine the Future as well as the Present. His treatise presents to you not merely a fanciful dream, but the forecast of a future which cannot help being fulfilled. Few people can comprehend the many advantages that are awaiting us in our new home on the Charles. Mr. Kebbon's article tells you of some of the things that are waiting for you.

HAVING been in constant attendance on the new Institute site in Cambridge since the fall of 1913, it has occurred to me many times as the buildings gradually took form and assumed an architectural character, that the new environment cannot fail to exert a tremendous influence on future Tech men. This thought recurred to me more forcibly than ever as I escorted several interested friends of Technology through the buildings this beautiful May afternoon, and listened to their exclamations of delight, as new vistas continually opened to their view. The great dome rose majestically above the colonnaded portico, light and shadow played alternately across the pilastered facades of the great court, and the long parapets arched in a graceful sweep to their termination at the pavilions.

I pictured the future beauties yet to be added by the groupings of trees, accenting the intersection of the buildings, and the broad grass plots lending color to the expanse of courts, with stone balustrades and seats surrounding splashing fountains, all serving to accentuate the scale of the architecture and to delight the eye.

And I reflected on the aesthetic impulse that will be felt by the future Tech man, as he wanders through the courts to classes, and lingers to catch glimpses of noble columns reflected in pools of water, thus receiving new inspiration as did the Greeks of old.

Retrospection led me to contrast all this with the drabness of his past environment in the midst of the busy City, hurrying through crowded streets between classes held in great warehouse structures, only finding relief when lectures led him to Rogers, the one building linking the past with the future, and happily to be retained for Institute purposes.

Let us turn to the new conditions surrounding the Tech undergraduate of the future, and accompany him through a single day of his Tech existence. He arises in the clear, cool morning air of his sleeping porch bedroom, enjoys a refreshing shower bath, and dresses

leisurely in the adjoining ante-room. As he passes through his study and gathers his books, he pauses to behold the charming view that greets him, as he glances through the casement windows, past the waving poplar trees, and beholds the blue waters of the Charles reflecting the picturesque sky line of Boston from the opposite shore. What a sense of delight he experiences at the very beginning of his day. He passes out into the sunshine through the dormitory gates, and walks along the Esplanade to the stately Walker Memorial Clubhouse. In the dining hall, he finds a table by an open window, already occupied by several of his classmates, and while breakfasting with them, discusses the crew race recently won from Harvard. Nine o'clock strikes, and he starts for his first lecture, mounting the several flights of stone steps to the great court, and passing between trees and hedges, until he reaches the main portico under the dome. Entering the high vaulted lobby, the marble walls of which still reflect the warmth of the sunshine, he soon finds himself in the great amphitheatre.

After the lecture, he proceeds to the splendid library directly beneath the dome, and opens his book in the quiet serenity of this modern Pantheon. The morning light streams through the round opening in the very top of the coffered domed ceiling, and brings out in slight relief the delicate mouldings of the entablature supporting the dome, which rests on a circle of slender Corinthian columns. An hour slips silently by, and then other classes claim his attendance in various parts of the buildings. His last recitation before the noon hour, calls him to the lecture room in one of the front pavilions, and before turning to his appointed task, he contemplates the picture presented to him through the window, of architectural mass silhouetted against the blue sky.

At luncheon, he seeks his fellows again at the long table reserved for them in the dining hall, and afterwards indulges in a game of pool before returning to afternoon classes. These soon come to an end, and the glory of the afternoon irresistibly draws him to the boathouse, where he selects a shell and rows up the Charles, passing under the various bridges until he comes in sight of the wooded hills of Mt. Auburn. He returns as the crimson glow of the setting sun plays over the waters, and is soon abreast of the Institute buildings again. After dinner, he joins the other men on the broad terrace opening out from the dining hall, and as he smokes, idly watches the lights twinkle into being along the Esplanade and on the opposite shore.

Here, we will leave him, thinking gentle thoughts and grateful for his present opportunity.

SCENARIO
OF THE
REUNION PAGEANT

FIRST PROCESSION

THE President and Faculty, assembling in Rogers, in academic costume, will move in procession through Clarendon Street to the Esplanade. The Charter will be carried in its casket by four instructors, accompanied by two members of the corporation, and the Seal will be guarded by halberdiers, and accompanied by torch-bearers. The Technology Banner will be carried in the midst. This procession will be led by the Marshal or sub-Marshal bearing Mace.

Arrived at the Esplanade the party will embark on the State Barge which will be decorated with banners, lanterns and flambeaux, with braziers of incense. On the barge will also be the Glee Club and a small orchestra. It will be rowed by 32 men and will be under the command of High Admiral Morss. A field gun fired from before the Court of Honor will signal the sailing of the Barge when a display of aerial bombs will be made on the Boston side. The Barge will be accompanied by 15 or more small boats containing the historic groups from the Chaldeans to the present day. These boats will also contain groups of singers and a few musical instruments.

The arrival of the barge will be signalized by a salvo of fireworks from the place of landing; the President and Faculty will disembark, being received by the Governor and Staff and the Corporation, the latter in special robes of office. With the Military Company as a guard of honor (and possibly the Lancers as the Governor's Guard) the procession will move up into the Court of Honour while a grand march is played. In the Court will be seven chairs of state on thrones, ornamented by coats of arms, banners, flambeaux, etc. In the centre, backed by the Colonade, will be the Technology throne and the stalls for the corporation, faculty, guests, etc., on the west side will be thrones for the representatives of the Nation, the Mayor of Boston and the President of Harvard, on the east thrones for the Governor of the Commonwealth, the Mayor of Cambridge and the representatives of other institutions of learning.

THE MASQUE

Chaos

As the steam curtain dies down, a mass of sombre shapes shot with comet-like flashes, moves intricately to dissonant music: crashes of sound accompany an apparently formless motion: waves of barbaric color and dull vapours succeed each other in a titanic struggle seen through atmospheric haze. The mass billows and boils in ever encroaching sweep until it reveals on its crest the Time-Spirit. The turmoil quiets, the Elements separate, music and lights soften and become brooding and dreamy. Order comes out of chaos.

THE DANCE OF THE ELEMENTS

The light which has largely been blue, violet and green, becomes golden, and seven small thrones are seen around

the perimeter of the circular arena. On each is seated an Element, surrounded by his satelites or manifestations, with Merlin (or the Time-Spirit) on the central throne. In the centre of the arena is a glass plate, with powerful lights below, of different colours. The Dance of Earth is first, and is followed by Water, when rain-bows play upon and the dancers. Next, and mingling with this dance is that of Electricity. Then comes the Dance of Fire which at last is combined with Water, and out of that heaving comes the Dance of Steam. Then all the Elements and their satelites, under the [illegible] one dance, which opens, all returning to their thrones, revealing in the centre Primitive Man, naked and [illegible]. The [illegible] the hymn of the First Fear, a groaning litany, and out [illegible] overwhelm Fire and force him to [illegible]

Primitive Man is shown practically [illegible] tral light and central dance [illegible] dance [illegible] truth that man alone cannot conquer Nature, and summons Will and Wisdom to the aid of man. Will is an athlete, young and [illegible] anding. They enter from the Colonnade, on either side of the central throne, and advance slowly, and together, towards the Dance of the Elements and the Thrones of the Forces. Then as many points as possible now enter the Heroic Groups, who join and sweep forward irresistibly. The dance ceases, the dancers retreating with Primitive Man to either side, and Will and Wisdom lead their forces to the Thrones, sweep down their occupant (except Prometheus) and an historic [illegible] take possession of it, the [illegible] Elements take up a great cry of [illegible] and exultant triumph, while the Time Spirit comes forward and [illegible], symbolizing the supposed victory of man over the Forces of Nature.

Then out of the darknes comes riding headlong on great horses, Greed, Vainglory, Selfishness and War. The [illegible] and primitive man fall into wild conflict.

[illegible] bat up to the h [illegible] man and join the conflict with all their [illegible] Will and Wisdom [illegible] falls back to either side, and from the [illegible] who move slowly forward through the

midst of the Court. Arrived in the centre, Alma Mater is lifted on a throne and carried on the shoulders of men up to the Throne of Technology, where, with her Seven Liberal Arts, she takes her seat, and a great chorus of triumph is sung.

The Triumph

THE WAR AND THE LAW OF EQUAL REACTION

By LEROY D. PEAVEY, M. I. T. '98
Vice-President, The Babson Statistical Organization

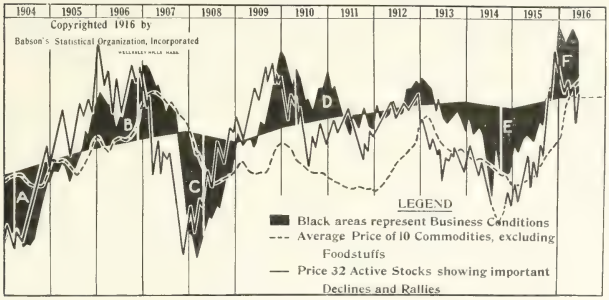
Editor's Note. At this time in the history of the world, the public is wondering what will be the next move and what will be the eventual outcome when the great struggle in Europe has come to an end. Many theories have been offered as to the solution of our problems after the war. *The Law of Equal Reaction*, appears to come nearer to the truth of the matter, than any similar argument published to date.

THE "Law of Equal Reaction." This, to my mind, is the greatest of all laws. It underlies every department of human activity, as well as being a predominating law in the mechanical world. When Sir Isaac Newton, some two centuries ago, enunciated the simple but far-reaching principle, "*To every action there is always opposed an equal reaction*," he stated one of the most tremendous truths of the universe.

We who have been more especially schooled in engineering pursuits recognize, indeed, this all-important law in its application to our technical studies. There is, however, no doubt that the great scientist fully believed in its close relation to all of the affairs of life, and if further years had been granted to his wonderfully useful career, he would have left behind, as he did in mechanics, astronomy, and similar fields of knowledge, a well-developed application of this law to chemistry, to the human body, to the national life, to economics and even to ethics. In fact, McLaurin, in his famous treatise entitled "Sir Isaac Newton: Philosophical Discoveries," [illegible] what was in the mind of this great master along these lines. [illegible] the fundamental principle the more we are impressed with its inevitable operation. When viewed in the proper light, indeed, a new significance is given to the pronouncements, "An eye for an eye and a tooth for a tooth," "Whatsoever a man soweth, that shall he also reap," "Give and it shall be given unto you," etc.

Emerson, more than a hundred years after Newton, voiced this same thought when he gave utterance to the following: "Always pay for, first or last, you must pay your entire debt. Persons and events may stand for a time between you and justice, but it is only a postponement. For every benefit which you receive, a tax is levied, but the benefit we receive must be rendered again, line for line, deed for deed, cent for cent, to somebody. The physiologist has observed that no creature can live, but a certain compensation, balances every gift and every defect. A surplus arm given to one part is paid out of a reduction from another part of the same creature. If the head and neck are enlarged, the trunk and extremities are cut short. The law of compensation will not be balked of its end in the smallest iota. It is in vain to build, or plot, or combine against it. Things refuse to

be mismanaged long. If the government is cruel, the governor's life is not safe. If you tax too high, the revenue will yield nothing. If you make the criminal code sanguinary, juries will not convict. The absolute balance of Give and Take, the doctrine that everything has its price; and if that price is not paid, not that thing but something else is obtained, and that it is impossible to get anything without its price—this doctrine is not less sublime in the columns of a ledger than in the budgets of states, diminished and then negatived. There follows a limiting of production, which is combined with economic losses. Production drops below the level of what is required, and this again leads to a condition favorable for production. The wave rises, reaches its highest point, and then falls again to the negative side. Just as mathematics long ago succeeded in separating even the most complicated movements into their simple, periodic, component parts, so the statesman must learn to decompose the totality of human



in the laws of light and darkness, *in all the action and reaction of nature.*"

To leave, however, the realm of ethics and to descend to economics, it is at once evident that great business booms and business depressions are simply examples of the operation of the Law of Equal Reaction. Professor Ostwald, late of Leipzig University, says, "A period of great prosperity is succeeded by a period of depression, to be replaced in turn by prosperity, and so on. The cause of this is well known. In good times we produce too much. Through the overstocking of the market the success of industrial undertakings is at first

movements into the simple wave elements produced by self-regulation in the various field of human activity. In this way politics can be transformed from a mere knack, as it has been regarded since olden times, into a science like technology, with the power of sure and far-reaching prophecy."

It is the application of this principle to economics, business and finance that the writer, in conjunction with Roger W. Babson, has for several years been developing. The outline of the black areas in the diagram shown herewith is a composite record of actual business in the United States for the years noted. I

will not take time here to [illegible] diagram, as the [illegible] fully explained by Mr. Bab[illegible] the May, 1915, issue of the Technology Monthly. Suffice it to say that the Law of Equal Reaction operates to produce normal business prosperity and areas of business depression above and below the Line X-Y of the average business growth of the country. Here it will be noticed that the war found us [illegible] 1914 sailing towards the bottom of a depression area. What would have happened if the war had not burst upon us at the height of an era of prosperity, such as, for instance, the present, may be shown on the diagram herewith. [illegible] better to understand than in words. The Law of Equal Reaction, however, had already brought [illegible] almost [illegible] that the business [illegible] was not far distant.

Of course [illegible] went up. "business [illegible] stimulated." And so it was, for the moment, but the student of the basic principles involved in this article knew that a great improvement would soon be in order. He had already prepared himself for the depression. His stocks of goods were low, his credits were in good shape, he had an abundance of cash stored up for just such an emergency, and he began to plan his sales campaign and ready to take advantage, as ever, of the coming business uplift. While he was laughed at by the great majority, and told that the only thing for the business man to do was to go "Back to the land" and give up business for a while, he steadfastly looked forward to an early reaction from current conditions. He was abundantly rewarded. In six months' time metals and [illegible] were leaping upwards by [illegible] and [illegible] trade was awakening to such activity that the manufacturer hardly knew which way to turn. The [illegible] business had acquired a [illegible] and a burst of speed, and [illegible] of the industrial corporations affected were climbing higher and higher every day.

The [illegible] of prosperity is well known to all. Everything is going full blast, railroads finding it impossible to move freight, labor growing scarcer and scarcer, and prices continually rising. Will these good times, however, always last? No, the Law of Equal Reaction never fails, and we shall soon [illegible] on the downward swing. Orders will fall off, [illegible] goods will pile up on the shelves, and prices will crumble. Happy, [illegible] will be the student of business conditions. He will put his house in order, and gradually get [illegible] for another depression. Some say, "Well, but the war is now with us and this will upset all calculations." No, the Law of Equal Reaction is absolute, and just as a few years ago the wise ones were preparing for a big boom, so now we must begin to prepare for a slump which, like night follows day, must eventually occur.

Yes, the machine shops have been converted into munitions plants, extensions and additions have been made at a rate never before known, and cities have sprung up in a night around these bustling centers of activity. What, however, of the coming days? We are now overexpanded. Factories are refusing orders and elevator boys and bell-boys have secured new jobs at mechanics' wages. Everything else is on a similar scale, but the day of reaction is coming. One of these days "For Sale" signs will be on machine shops all over the country, and we shall be able to buy first class machine tools and other factory paraphernalia from the junk man.

Again, take the subject of commodities. During the present period of prosperity commodities, with rare exceptions, have soared skyward to a point almost beyond comprehension. Steel, under the combined influence of war and domestic business, has advanced from $19.00 a ton to about $50.00, an increase of 160 per cent; copper, another staple metal, has jumped from 11c. to nearly 30c. per pound, a still larger percentage of increase; and spelter has made an almost unbelieveable record of advancing from 4c. to, in some instances, as high as 35c. per pound. A similar action is noted in silver, wheat, petroleum products, and many other articles. In fact, Bradstreet's Commodity Index has advanced to the highest point ever recorded, and the London Economist Index, of course, shows a still more wonderful movement.

Such, in brief, are the astonishing facts. The law of supply and demand implies that it is impossible to prevent sellers from advancing their prices until they reach a point where buyers refuse to purchase except from hand-to-mouth. Then a decline sets in and the rising prices will be offset in some way by an equal reaction. It is a ten-to-one chance that the day is coming when copper can be bought for 10c. or less per pound and the steel and other similar situations will be deflated as a pin-prick collapses a toy balloon.

The present war has assisted this country in accumulating in a most spectacular manner an astounding trade balance in our favor. It will be remembered how, at the outbreak of the war, business came almost to a standstill. The trade balance was decidedly against us. Everybody was afraid to move. Europe was dumping securities on this side and great excitement reigned as to how payment could be made to Europe and the unfavorable trade balance be reduced. The situation appeared so grave that a delegation of London financiers came over to help us find a way out of the difficulty. However, a reaction from this distress was already on the way. Soon it was whispered that stupendous European orders for zinc, copper, munitions, grain and other war supplies were expected.

Orders kept piling up. Tremendous shipments of wheat and other commodities began. During the first eighteen months of the war approximately $2,000,000,000 of war exports left this country. Meanwhile, heavy shipments of other products to both neutral and belligerent countries went on, and in an incredibly short time the unfavorable trade balance necessitating the exportation of $1,000,000,000 gold, was turned into a balance of billions of dollars in our favor, enabling us to draw about $450,000,000 of gold from Europe. Such a condition of things is unprecedented, but a reaction is coming again. Will the competing nations forever sit by and see us take advantage of their present troubles? Not by any means. They will do their best to recover in some way the advantage which we have gained through their adversity. It is an absolute certainty that the balance of trade must be more nearly equalized, and the only way this can be done is by our selling fewer goods abroad or by Europe's "dumping" their goods over here. Both are possibilities.

So the Law of Equal Reaction is continually operating in every phase of activity. The European War, and in fact the Mexican trouble, like all other wars, are simply additional illustrations of this great principle. If one nation takes abnormal advantage and through customs barriers, peculiar immigration

laws or unwise class legislation, attempts to get more than is justly its due, retribution is bound to come. It may be long in coming, but if so, its advent will only be more violent. The native Mexican masses (peons) have been grossly abused for years. The land in Mexico is concentrated in the hands of a comparatively small number. Mexican revolutions are the inevitable result. The "social" that is needed is education along right lines and an adjustment of property holdings. Then will come a beneficent and healthy reaction from present conditions which will place Mexico on a plane such as it never has seen.

As to the [illegible] war, the only way to avoid such catastrophes is for the nations of the world to begin to co-operate instead of so bitterly opposing one another. Instead of grabbing for foreign trade, and hedging then nations in with tariff barriers and compassing land and sea with military propaganda to hold their gains, let them get together. We are now suffering a reaction due to the above destructive policies, *and a* [illegible] nation has both a certain line of normal growth and a certain proportion of the earth's resources. Statistics show that so long as these relative proportions remain constant between the different nations, there is peace. With existing inter-nation barriers, however, when the growth of one nation is much greater than that of another or when one nation attempts to control more land than its due proportion, there is war.

The way out is this: (1) Let each nation develop through co-operation, industry and economy, a fundamental strength equal to the proportion of the earth's resources which it holds, and increase this growth at a rate equal to that of any competitor. In simple language this means developing the healthiest, happiest, and most efficient people on the face of the earth. (2) Let us all endeavor to get inter-nation trade and foreign development under international control, so as to assure equal opportunity and security to the peoples of all nations. This means the wiping out of all unjust tariff, immigration and other discriminatory legislation, and finally [illegible] Peace Conference at Geneva. Let the Red Cross will bring to us all the maximum of efficiency and happiness.

COPPERHILL AND TYPICAL SULPHURIC ACID PLANTS

By KENNETH DESPRES KAHN, M.I.T., '15

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Ex-Editor-in-Chief, the Technology Monthly and Harvard Engineering Journal (1914-1915)

In collaboration with

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PEOPLE who have grown accustomed to the staid and steady ways of New England cannot as a rule readily appreciate the facts and history of a modern "boom town," and very often too little attention is paid to the development of the newer American industries. One can hardly imagine the speed and magnitude of the booms of towns like Hopewell, Virginia; and Copperhill, in the Ducktown copper district of Southeastern Tennessee.

The Ducktown basin has long been famous for its rich copper mines, but it was not until recently that the industrial corporations of that section began the manufacture of sulphuric acid, which is recognized as one of the most important, if not the most important, of our chemical products.

LOCATION

The location of the two copper smelters and acid plants with reference to railroad connections, is somewhat peculiar. The Tennessee Copper Company which is the largest concern in the district is located at Copperhill, whereas the Ducktown Sulphur, Copper and Iron Company, Ltd., an English owned company, and the pioneer industrial organization of the district, dating back to 1891, has its smelter and acid plant at Isabella, Tennessee, four miles from Copperhill. This company maintains its own train service between the smelter and the railroad, connecting with the Atlanta Division of the Louisville and Nashville Railroad at Copperhill.

Just a short time ago Copperhill was merely a flag-stop on the L. and N. railroad. Now it is a town of about 10,000 and the home of the largest sulphuric acid plant in the world.

THE PIONEER COMPANY

Turning now to the smaller, but pioneer company of the Ducktown basin, we may trace some of its major activities. It soon became apparent after the initiation of copper smelting of the pyritic ores of this location, that the sulphur in the ore could not be utilized so long as it was allowed to escape from a large area as was the case in the practice of "heap roasting." It was necessary that the sulphur be eliminated from the ore within a small compass. Pyritic smelting promised the only means of so doing; but pyritic smelting was at this time still largely a matter of theoretical possibilities and disappointing experiments. The process was developed largely by this pioneer company. Under the conditions of the new smelting practice, the escaping sulphurous acid gas was confined within the narrow limits of the copper-blast-

furnace smoke stack, and thus it offered conditions favorable to its further treatment and recovery as sulphuric acid.

THE MANUFACTURE OF SULPHURIC ACID

From the advent of pyritic smelting, laboratory investigations and experiments were conducted over an extended period by the company's chemist, with a view of adapting one of the well known acid processes to copper-blast-furnace conditions. That process known as the ferric-oxide contact process was selected and a ten-ton unit installed to test the practicability of the process under the prevailing conditions. The results obtained from this experimental plant clearly demonstrated that the process had not yet reached a stage commending it to copper furnace conditions.

Attention was next directed to the possibilities of the chamber acid process, which under the direction of Mr. N. L. Heinz, chemical engineer and acid expert was destined to solve the problem. Under a contract Mr. Heinz undertook to design, superintend the erection of, and put into operation a chamber acid plant of the capacity of 160 tons of 60 degree Banne sulphuric acid daily. Ground was broken on July 14th of that year for a plant covering approximately two and a third acres,—the largest area covered by any single undertaking of the kind in existence.

On June 11th of the next year (1909) the system was completed and the fans started. Four hours later the chamber drips were running freely, and a yield equivalent to 83 tons of 60 degree Be acid was recorded for the first day.

TENNESSEE COPPER CO. PLANT. SMELTER AND ACID PLANT COPPERHILL, TENN.

The magnitude of this achievement is almost unbelievable. Even in the great industrial centers of the East, it is doubtful whether an undertaking of this size could have been successfully put into operation with such celerity and sureness. All the more, to have accomplished this new adaption of a chemical process far from the source of supply of industrial materials and skilled

labor, suggests readily enough the excellence of the engineering ability and scientific designing of the builder. During the construction and after its completion and subsequent operation numerous engineers and technical men from all parts of the country came to study the design and structure of this plant.

Some idea of the magnitude of the undertaking may be obtained from the facts enumerated below. Construction of the plant entailed the excavating of 30,000 cu. yds. of earth, the placing of 6040 cu. yds. of concrete, and the erection of 1,000 tons of structural steel, over a million feet of lumber, a million bricks, and 2,750,000 pounds of lead. It is of additional interest to note that with the exception of the structural steel erection and lead burning, the entire work was done by native labor and local artisans.

THE SOLUTION OF A COMPLEX PROBLEM

The problem presented to the acid expert was both a novel and a complex one. It imposed many conditions foreign to the usual sulphuric acid manufacturer; such as the contamination of the gases by smoke and flue dust unavoidable in blast furnaces, irregularities in furnace conditions and consequent fluctuations in temperature and composition of the gases, the presence of carbon dioxide from combustion of coke (which unfortunately cannot be entirely dispensed with even in pyritic smelting) and further increased by an appreciable quantity from the decomposition at the furnace temperature of the calcium carbonate in the ore into lime and carbon dioxide.

Owing to the fluctuations in composition of gas, an average analysis would convey little idea of conditions to be met and provided for. Under fairly normal conditions the gases delivered to the chambers are approximately as follows: Sulphur dioxide, 3 1-2 per cent; Carbon dioxide, 3 1-2 per cent; and Sulphur trioxide, trace. The temperature of the gases in the furnace flues frequently changes over a range of 200 degrees Centigrade in every eight or ten minutes.

Anyone conversant with the reactions of the process will readily understand that a chamber acid plant of ordinary design would be wholly inadequate to meet such variable conditions. The flue dust calls for special consideration since it carries a large percentage of zinc in the form of impalpable sulphates and oxides that are prone to be carried into the system, clogging the gas passages and flues, and even the circulating acid pipes. Moreover, zinc in itself is an important by-product to be recovered.

It is in the special provisions designed to meet these exceptional conditions that this plant differs chiefly from the ordinary chamber acid plant.

OPERATION OF THE PLANT

The original smelting plant before the manufacture of sulphuric acid was commenced, consisted of two furnaces of the usual water-jacketed type, each with an independent brick flue leading to a common brick dust chamber at one end of which stands the old smoke stack now cut off by a damper. From the furnace-dust chamber the gases now pass into and rise through a cylindrical tower, thence through a dust catcher which consists of a rectangular chamber containing a system of channel irons. Each Channel is held in place by trunnions resting in the walls. On one side the trunnions extend through the side wall, the ends being squared to take a wrench by which they can be revolved and their accumulated con-

tents periodically dumped to the floor and later withdrawn through appropriate openings underneath.

The coarser particles of flue dust readily come to rest in the anterior flues and furnace-dust chamber. The impalpable metallic oxides and sulphates respond but slowly to gravity at high temperatures, even at the slow speed attained in the flues and dust chamber, hence the introduction of the channel irons offering surfaces of repose at all points between the floor and roof of the dust catcher.

THE "TOWER BUILDING" IN COURSE OF CONSTRUCTION

From the dust catcher a brick flue runs the full length of the tower building with separate off-takes to each Glover tower. In each of these off-takes are placed nitre boxes for the decomposition of sodium nitrate. There is also an auxilliary set of similar nitre boxes at the end of the dust catcher for emergencies. In addition to these a special and original method of dealing with the valuable nitrous compounds has been worked out and put into successful operation.

GLOVER TOWERS

The gases having been cleansed of dust and brought to proper degree of temperature are now ready for the first step of the process; viz, the two Glover towers, each 12 feet square and 45 feet high, filled with checkered layers of a patent chemical brick. Entering the bottom of these towers the gases ascend to the top, whence they are led downward again through a system of external pipes to enter the bottom of a special tower through which they again ascend and pass on to the chambers through two lead flues each 42 inches in diameter. Special mention should be made of the extremely high oxidation of the sulphur dioxide. In three towers fully 25 per cent of this gas is converted to sulphur trioxide. The concentration of the cham-

ber acid is accomplished without any external aid from cast iron pans, etc., generally used in the ordinary chamber process. While this plant has a normal rated capacity of 160 tons of 60 degree Bé acid per day, it has been demonstrated that this is not the maximum capacity, as a concentrating capacity of over 200 tons of 60 degree acid has been attained when actually needed.

ACID CHAMBERS

Situated between the towers and the chambers are four powerful fans to force the gases through the system. These consist of similar units, two forcing the gases into the front chambers and two withdrawing them from the rear. These fans are made of hard lead (an alloy of 90 per cent lead, 10 per cent antimony) and are of special design.

Next in train are the sixteen chambers, comprising two sets of eight each. Each chamber is 96 feet long, 22 feet 8 inches wide and 30 feet high. The total volume of the chambers is 1,050,000 cubic feet.

GAY LUSSAC TOWERS

From the chambers the gases pass in to the six Gay Lussac towers where the nitrogen compounds are recovered in the same manner as in all modern and well regulated chamber plants. It has been the belief of many acid manufacturers that only a "sludge" acid could be produced in a chamber acid plant which utilizes the waste sulphur gases from a pyrite smelting furnace. That such is not the case, in this instance, has been readily acknowledged by several well known experts, who, after having seen the manufactured product delivered from the Glover towers to the storage tanks have expressed surprise at the purity and clearness of this acid.

It is of interest to note, in conclusion, that the "Copper City of the South" as Copperhill, Tennessee, is aptly called, is still the scene of industrial activity and extensive construction work. In addition to the experimental plants which are in the course of construction and operation in all parts of the basin, there is now being erected an additional chamber acid plant of approximately 600 tons capacity daily. Thus Copperhill is fast becoming one of the sulphuric acid centers of the world.

THE ENGINEER COMPANY

By EDWIN T. COLE, MAJOR, U. S. ARMY

THE organization of a Volunteer Engineer Corps this year by Technology students has been of importance more as a matter of promise than of actual performance. This has not been the fault of the members who have been most earnest in their desire for instruction and improvement. The trouble has been the impossibility, up to date, of rising above very adverse conditions. The members have worked hard at close order infantry drill in which many of them had already had enough experience. This has been valuable to the organization, for although such drill is among the least important of the training of engineer troops, the psychological effect of drilling together is a necessary part of the instruction of any military body. The only danger of the course is that, while in lectures we have spoken of many varied duties of engineer troops, the actual work has been confined largely to infantry work. This led some to think that the greater part of the training would be in such work, and that all the other duties were secondary. We hope to show you as civilian engineers that the army drill and discipline is a good thing to apply to any work, and that the highest efficiency results from the drill that enables a big bridge train to come down to a river bank, start building the bridge with the first wagon unloaded and to accomplish the task, many times under deadly fire, in the minimum time possible for such work. However, we wish to impress these lessons not by word of mouth but by demonstration.

The limit placed on the instruction has been necessitated by a combination of conditions, so bad that sometimes I wish that the organization might have been postponed until next year. We have had to drill in an armory where we had only temporary rights and could not accumulate or store materials necessary for instruction. Instruction presupposes the ability to tell people what you wish to accomplish, and what part you wish them to take in such accomplishment. Bridge building is one of the most important duties of the military engineer. We had two of the clearest and best lectures I have ever heard on the mechanics of wooden beams and simple trusses but without much profit, for when trains were not going past, the other company was drilling. Lacking then the place to use and store equipment, facility for explaining its use, we had still greater lack in what might have been more properly placed at the head of our disadvantages, for we did not have any equipment nor any source of securing it. The War Department could not see its way to giving us any assistance whatever The State has hoped it might be able to enlist part of the force as a part of its militia but has not been able to accomplish anything to date. The Institute had already been called on for more support by the Military Department than in any previous year, and we were only able to get the armory drill because the Commanding Officer of the Coast

Artillery was good enough to see that we might help supply him with some of the specialists he needs from time to time and adopted us as a provisional organization for instruction.

One cannot do engineering work without tools and materials and a place to work and a place where instruction is possible. All we have had was a fine bunch of men eminently fitted for such instruction and undoubted enthusiastic. I most sincerely hope that the men have not been too much discouraged by the handicaps under which they have labored, for next year the conditions will be improved beyond anything I had hoped up to a few weeks ago. I knew that we would have a place to drill at the new site where we could work on mechanical construction and build bridges even if we had to imagine the rivers, learn the proper way to make trenches and obstacles, teach sketching, etc., a place where one could go into the blessed open and talk to a lot of men without having his voice flung back at him mixed up with the ever present roar of the passing train. I still hoped for State co-operation but felt that we could gradually get together tools and equipments even without such help. But now the new army bill just passed will give us every facility for organization and work in this line. They will be so glad to have us do the work that they will furnish uniforms, arms, equipments, tools, instruments and, under certain restrictions as to the amount of work done per week, and previous military training, will pay those conforming about $85, per year. Space will not admit of explaining at this time all the provisions of the bill, nor are the details of its administration yet published, but we will no longer be out in the cold trying to serve National or State Governments without visible signs of appreciation.

General Wood was very much impressed with the great value of an engineer body based on Technology. He was so anxious to prove the need that he communicated with the Engineer Officer that we had a force ready to do some sorely needed map work, which might, in time of war, be of vital importance to this section. Unfortunately I had to decline to consider the matter, as, under present conditions, no money was available for instruments or supplies or even for getting the men to and from the working place. General Cole has been enthusiastically in favor of the work for several years but has not yet been able to secure enabling legislation. The Washington authorities of the Engineer Corps and the General Staff are impressed with the great value of such a body. Reserve Officers for the Engineer Corps in time of war could well be picked from Technology men under any condition. If during their course here they specialize in Military Engineering, and we maintain an organized body of engineer troops inwhich even the privates are soon to be graduate engineers, we will have a body of most unique value. In time of war we could give to the country many men who were specialists on the civilian problems of the engineer but with full knowledge of those of the military engineer. When I tell you that the new bill would allow many of these men to be appointed additional officers of the Engineer Corps of the Army on graduation and give them six months of service as lieutenants with troops paying them $100 a month and all regular allowances, it will be apparent that we are the first in the field in this line and ought to be able to furnish the entire supply.

As discouraging as circumstances have been to date I do not fear the Engineer Corps will go to pieces. It was not one of

those excitement born organizations of the past year. The general idea that it is time to look ahead had much to do with bringing the organization into existence at this time, yet it may not be generally known that we started to organize such a body five years ago. We have always had plenty of men willing to go into it, and the organization has been put off from time to time waiting for legislation which would make it a practicable working force.

FACULTY HONORS

V

RALPH ADAMS CRAM

Marshal of the June Pageant

"RALPH ADAMS CRAM, Marshall of the June Pageant, and Senior Professor of Architecture at Technology, was born in the year—" might well enough begin the catalogued account of one whose sphere is bounded by the class room, and whose influence could hardly outlive the dust-dry chronicle of his narrow existence; but for one whose work alone, aside from the dynamic vitality of his personality, is an inspiration and an incentive to those who study under his guidance, the method hardly suffices. Chronicled details become insignificant, and the man himself stands out as commanding all attention.

The man himself, his character, his individuality—for in all his works there is evident an idealism which makes of his profession a quest for the highest and the best, in all his actions there is seen a striving for those things which have made his craft epitomize the most spiritual expressions of human aspirations, in all his words a seeking for that side of life away from the material, and in the man himself a will strong to follow the bidding of his ideals and an intellect powerful for the attainment of them. The title of Professor does not adequately describe Ralph Adams Cram's function at the Institute, for he is a true teacher of men, not an expositor of text-books.

A full list of Prof. Cram's titles, though conventional, would be tedious, but the mention of some of them may help those who are unacquainted with his work to gain a conception of his manifold activities. Prof. Cram is chairman of the Boston City Planning Board, and of the Commission on the Heights of Buildings. He is President of the Boston Society of Architects, Supervising Architect of Princeton University, a member of the National Institute of Arts and Letters, an Associate of the National Academy of Design, a Fellow of the American Institute of Architects, a Fellow of the Royal Geographical Society of London, an Honorary Corresponding Member of the Royal Institute of British Architects, and he holds the honorary degrees of LL.D. from Yale, and Litt. D. from Princeton.

Prof. Cram, needless to say was not born to these titles—such distinctions come only as the acknowledgement of proved ability, and it can justly be said that all he has won has come through dint of his own efforts. For Prof. Cram has not even had the advantage of college training.

His father, a clergyman, brought him to Boston from Exeter at the age of sixteen, and consulted with Prof. Ware, then head of the department of Architecture at Tech. as to the boy's future. As a result young Cram took a position as an assistant in the office of Rotch and Tilden, architects, in Boston. Thirty-four years later Prof. Cram succeeded

of the chair held by Prof. Ware at the time the latter was instrumental in starting him on his career.

Meanwhile, in thirty-four crowded years, as an essayist, a writer of short stories, a lecturer, and more especially as master of his chosen profession Prof. Cram had hewn out for himself a reputation national and international. As a member of the architectural firm of Cram & Ferguson he has given to this country some of the most beautiful buildings it posesses, an as architect devoted more especially to ecclesiastical edifices he is responsible for a good proportion of those few churches in this country of which, from an esthetic and architectural standpoint, we may be proud, and as an idealist for whom workaday utilitarian methods do not suffice, he has given his greatest efforts toward a realization of those conditions under which alone work of true value and beauty is possible.

The best known buildings for lay purposes designed by Prof. Cram's firm are the Graduate College and Cleveland Tower of Princeton University, the Rice Institute of Huston, Texas, buildings at Williams College, Richmond College, at Sweet Briar, Va., Phillips Exeter, all the rebuilding at West Point, and public libraries in Fall River, Pawtucket, and Nashua.

Of the more important churches by the same firm are the Halifax Cathedral, the Detroit Cathedral, the Pro-Cathedral, Havanna, and churches in Pittsburg, Cleveland, Chicago and St. Paul. But probably the most celebrated place of worship completed to date, described journalistically as the "most sensational church of all" is St. Thomas, New York, Gothic in style, and one of the most beautiful edifices we have in this country. Prof. Cram was for some years consulting architect of the Cathedral of St. John the Divine, of New York, a cathedral comparable to the great monuments left us in the old world in the care of its design and the luxury of thought detail and money lavished upon it. The entire work of the nave, the Synod House, Bishop's House, Deanery, and a chapel of the Chevet, are by the firm of Cram & Ferguson. But that church which in the future will probably form the greatest monument and testament to Prof. Cram's devotion to the ideals of his profession, and his love for the incomparable beauties of Gothic architecture is the one now building at Bryn Athyn, Pennsylvania.

This church represents the most heroic effort since the days of the 15th Century of craftsman to realize in spirit and perpetuate in stone the true essence of the gothic, that style, which, developed in answer to the needs of Christianity typifies and symbolizes that austere and spiritual creed even to the extent that the reverent and loving fashioners of it, inspired as they were, felt the spirit of Christ in their souls. At its best, as we see it in instances in the old world, it epitomizes all those spiritual beauties, all those emotional yearnings which have spelled faith to the followers of Christ. And it is that best which Prof. Cram is trying to realize at Bryn Athyn. Not the mere hollow form, the architectural shell, the stylistic pattern, which can be copied as an old masterpiece can be copied, and with the same success; but the spirit, the genius that animated the style, that made it a living vital force, that gave it that primal appeal to the emotions, that loving care that made possible the wealth and the completeness, the warmth and the humanity of the old Gothic; these things Prof. Cram is striving for in the church at Bryn Athyn. Built regardless of expense, time, or labor, every stone and

every other thing that goes into the edifice is cut or made on the premises. Huge wooded beams for the roof are carved by hand at the church itself. In his effort to reproduce the conditions under which the Gothic attained its highest development Prof. Cram has gone to the length which we modern Americans find difficult to comprehend. Not only is everything connected with the church done by hand on the spot, but every column, every detail, before constructed from the plans, is made and tried out in small model, then in half size, then in full size. The model, inserted in its place in the building is criticized, taken out and altered as often as necessary, until it meets every requirement, then and not until then its image is carved in stone. In like manner and with like care everything else connected with the edifice is done. A kiln for the stain glass windows is being constructed on the grounds, all the metal work, the hinges, locks, screens and grills will be designed and made on the premises, and the hurry and rush and makeshift methods of today are as rigidly excluded as though the hands of the clock had been turned back to the 15th century.

As a dreamer of dreams which for most people remain in the realm of the shadowy and the unreal but which he has the courage to attempt in the concrete, Prof. Cram has shown himself in more instances than the one cited above. For example as member of the committee on the Pilgrim Tercentary, the richness and fertility of his imagination is well illustrated in the boldly original scheme he has conceived for its celebration. Turning from the usual form of World Exposition as increasingly mechanical, commercial and material, he advocates a World's Fair in Boston in 1920, excluding manufacture, trades, transportation, industry, and confined exclusively to the cultural achievements of the world during the past three centuries—"significant, novel, attractive, destitute of the commercial element." The plan means essentially the transformation of the Charles River Basin. On the latter he pictures a series of irregular islands, separated by canals and lagoons, connected by bridges and gondolas. On these islands would grow a fairy city, "galleries, theatres, opera houses, lecture and concert halls, restaurants, churches and gardens, a miniature Venice, picturesque, charming, personal." One can almost hear the languid music floating at dusk over the quiet waters from the gondolas as they glide past, and watch the lights starting up, reflected on the waterways beyond, as the darkness rises up in the east, and the shell pink image of the heavens fades from the waves. Unconsciously there is forced to mind the "stately pleasure dome" of Kuble Kahn:

"The shadow of the dome of pleasure
Floated midway on the waves:
Where was heard the mingled measure
From the fountains and the caves.
It was a miracle of rare device,
A sunny pleasure dome with caves of ice!"

The latter, men regard as the wonder fantasy of a poet, the former is the vision of the man of action who dares project his poems into the concrete.

Likewise, in the planning and execution of the June Pageant, there will be seen the result of Prof. Cram's vigorous imagination, and, unless all signs fail, it will be an event of which we, who as undergraduates are taking part, will long delight in the remembrance.

The "Poet of Action" however gives way to the man of public service and wide social vision when we consider

Prof. Cram's activities on the City Planning Board and similar bodies. He is seen here in a somewhat different light, as an active worker "pro bono publico," as a man of large foresight in community affairs.

Active, yes, always active, with surprising surplus energy, appraently unremittingly "on the go," and apparently untiring. Despite his routine work as teacher, as architect, as business man, as member of many committees, he is ever to be heard, here and there throughout the country, lecturing on the topics varying from Art to War. And withal he still has time to write on his pet subjects, and as author of the books "Church Buildings," "The Ruined Abbeys of Great Britain," "Impressions of Japanese Architecture and the Allied Arts," "The Gothic Quest," "Excalibur," "The Ministry of Art," and "The Heart of Europe," to say nothing of his frequent contributions to magazines and professional publications, he has made for himself a name as a literateur through several continents.

The above, a surface sketch only, may give some idea of the accomplishments of Ralph Adams Cram, but it is the personality of the man which most merits attention, a personality which means to the student far more than books and texts and formulae, a personality to which one, who first comes in contact with him, may well respond as did Keats to the magic of Homer: "Then felt I like some watcher of the skies, when a new planet swims into his ken."

TECHNOLOGY BRANCH
HARVARD CO-OPERATIVE SOCIETY

By MAJOR EDWIN T. COLE
Major U. S. Army
Member of Board of Directors, Harvard Co-operative Society, Representing Technology

Editor's Note. Technology has, in Major Cole, a worker. Largely through him the students are to benefit next year by the membership in a branch of the largest and best established Co-operative system in the United States. It is a proposition which means a great saving to every student, and is something that every one should enter into, and help make a success. Few other Colleges have such an opportunity. They have to labor through the trials of establishing a system for themselves. Our new situation will eliminate any such work for us, and—well read the article, Major Cole explains the conditions in an interesting and concise manner.

ABOUT a year ago the Institute Committee took up the subject of establishing a new Co-operative Society or so amending the regulations for the present arrangement as would make it more nearly conform to student ideas. The committee found the task of a thorough investigation rather more extensive than they could carry on in the time they had available and asked the assistance of the Alumni Council. The Council appointed a committee which made a most thorough investigation extending all over the country. The result of the investigation was to show conclusively that one of the most successful Co-operative Societies connected with any college was that of Harvard which has been in existence over thirty years and does a very large business. It was suggested that as Technology and Harvard had formed an alliance as to certain of the departments, the Harvard Society might be willing to establish a branch store at Technology giving to students of the latter institution all of the benefits of this branch as the students of Harvard benefit from the Harvard Square branches.

The official report does not make it clear from what source came the suggestion of this Technology Branch but looking at the enormous advantage of such an arrangement to Technology and the very remote gain to Harvard we cannot but admit that the agreement to establish such a branch showed very great generosity on the part of the Harvard Society. Technology without this generous assistance was confronted with the proposition of financing a new corporation which might be a success or a failure, of establishing wholesale relations not on established business but on hope of business, of struggling along with amateur management or paying a sum for professional management that would have been a big draft on an unestablished business, of learning proper kinds and quantities of stock by costly experimenting. Doubtless even with city competition a society might have been built up in time if the students had loyally supported the enterprise, but it is asking a good deal of people to support an enterprise of this kind which offers them nothing more than promised benefit in the future, especially when you ask the support of students who will not be able to profit by that future.

The necessity of starting with, and overcoming all these handicaps has been spared them. The generosity of the arrangement goes even further than this

for the Harvard Society is to carry all the expense of accounting and of superintendence without cost to the Technology Branch until it gets established on a basis firm enough to enable it to handle its share. The branch gets the benefit of the established wholesale relations and large buying power of the parent store. As an illustration of this much this means the Harvard Society handled the entire contract for furnishing the extensive Freshman Dormitories at Harvard and has been able to secure the contract for furnishing the new dormitories at Technology because they were able to fill this $15,000 Harvard Dormitory contract at better rates than could be secured elsewhere for this large purchase. As an example of their ability to purchase stationery at the best rates they do all the purchasing in this line for Harvard University, including the large paper purchases for the Harvard University Press. There can be no doubt that with this large purchasing power they can buy much more cheaply than could a new store started by Technology even if such a store could avail itself of the expert services of such Department Managers as the older society has.

A most natural question is: "Why is the Harvard Society willing to establish and finance this branch and work towards making it a success?" It is a fact that the benefits which they will receive are rather remote, and that their action is based largely on good will and comity. What benefit they may receive depends on how great a success the Technology Branch achieves, and will not in any case be great enough in itself to furnish a compelling motive if the real good will was lacking. So far as can be seen at present the main benefits that may accrue are the increased purchasing power which will enable them to contract for larger quantities of certain supplies, to take whole editions of certain books, etc., and that Technology will in the future be able to share certain of the superintendence cost. The general superintendent necessary to conduct such a business must receive good pay. It would be foolish to try and get along with a cheap man. It is better to have a high grade man, pay him liberally and reduce his cost to the business by giving him more work to do. The same is the case with the skilled heads of departments. It naturally takes skilled men to handle such furniture and stationery departments as have been described. But they can just as well buy for both stores as for one of them. When the Technology Branch gets to the point where it is well able to pay its own way, then it will as is perfectly fair, pay its own expenses. The share of superintendence cost it will pay will reduce these costs somewhat to the Harvard Society in cases where the same men can handle the business of both. People are so apt to be suspicious of anyone doing anything really generous for them that in response to numerous questions I have carefully investigated the whole subject and can see no other gains which the parent society can make in return for all they are going to do for us. My original statement, viz., that they were starting this branch out of pure good will and a desire to prove themselves a real co-operative society by co-operating with us in this department as well as the institutions are co-operating in other departments, is a fair explanation.

It would be well at this time to make it perfectly clear that so far as any division of profits are concerned the Harvard and Technology stores are as much separate as if they were run by organizations in no way related. All profits on all goods sold in our store go to the ticket holders of the Technology Branch as do all

profits on goods purchased by the members at affiliated stores. In the beginning some things may be obtained at the main store in Harvard Square which will not be kept at the Branch. This will of course be but temporary. In this case the Harvard Square store will act as one of the affiliated stores crediting the purchaser with a more generous discount than any of the other stores. What small margin may be left over this discount is the only direct benefit that can accrue to the Harvard Branch from any purchase of a Technology Branch ticket holder.

To participate in the benefits of the store you must register for membership at a cost of one dollar per year. This registration fee has been found to increase the interest of the ticket holders in their store. One has made an investment of that amount and the only way he can get it back is to patronize the store. The money so taken in goes into general receipts and so much as is not consumed in expense of registration and keeping account and making distribution goes to swell the profit. You can buy at the store without registering. A large portion of the business done at Harvard Square is non-participating showing that it is a good store from any point of view, but you must register to get your share of the profit. This is the real benefit of the store, for all goods are sold at about the usual price; many articles cannot, by manufacturers agreement, be sold at less than a certain price. But in this store the first cost is not the important thing, for all profits over the wholesale cost plus the selling expense, including rent, heat, light, wages of sales people, etc., is returned to the ticket holders in proportion to their purchases. Remember you must stand by the store and buy everything there to make the dividends worth while. Some men register, buy about a dollar's worth of goods and when they get a check for nine or ten cents dividend, make a loud roar and go around displaying the check as evidence of the worthlessness of the store. The store is operated to supply you with everything you may obtain there at what it costs to buy and sell it without furnishing a living to a dealer, you being your own dealer; it can't afford to furnish you with important dividends for the use of your name.

Societies, fraternities, athletic association or special teams buying considerable quantities of supplies needed by the body will be given wholesale quotations in the beginning.

Technology has direct representation on the Board of Directors, the writer having been nominated by Dr. Maclaurin for that position. To make sure that the wishes of Technology students are carried out so far as is possible the Institute Committee will appoint a Committee representing the several classes to make known to me any student desires as to service or any criticism of conditions. It will be my aim, and I know the rest of the board will back me up, to make the Technology Branch meet in every practicable way the wishes of the students. No complaint or suggestion will ever be ignored because the matter is none of your business. The store is in a way the private business of everyone of you. The management with greater experience may have to turn down your suggestion but if you don't make it you have no one to blame but yourself.

Now what is the duty of Technology men in regard to the splendid opportunity of having a first class co-operative store, established and run by the management of the largest college store of the kind in the country, and based on thirty-four years of successful effort? It is clearly to join at once and support

the store right from the beginning, if you want to buy things at the best possible advantage. You owe this duty to yourselves, to those who are paying your expenses, and if money is so plentiful in your case as to make the amount you would save in a year of not much importance you still owe it to the Institute and your fellow students. You cannot afford to wait around and see how much of a success the store is going to be; you must help to make it a success and not expect others to do that for you. If all go in and join and patronize the store from the beginning it cannot help but be a success, but the measure of that success is very largely dependent on the membership and patronage of the first year. Technology is a mathematical school and this is very simple mathematics. We have rented a very fine store now being constructed. It is to the yard the most conveniently located store outside of the grounds. It will be sufficient in size for the needs of the whole student body. Suppose only a fourth of the students join then each one will have to pay four times as much of the rent of this store as will be the case if all join. The same will be the case with heat, light, janitor service and to a certain extent with sales expenses. The dividends will not be as great as they should be, the advantages will not be as apparent, fewer men will join the next year, the Technology Branch will soon reach its minimum level and do the minimum amount of good. A private dealer may take a loss for several years while building up a business. So long as his price is right nobody cares whether he makes or loses. A co-operative store can not pay a dividend greater than it earns to bring in custom. It is established for the benefit of a particular body of people and if a sufficient number of them do not take an interest in it, it soon loses power to benefit any of them.

Let us all get together then and invest one whole dollar toward giving Technology a first-class Co-operative store, toward becoming your own dealer in student supplies, toward showing in the very first year how much of a success your store can be. Having invested your dollar invest enough of your money to make your profits worth while, not only on a percentage basis but in actual dollars which you can use just as well as the other dealer to whom you might give them. When someone who has received twelve cents dividend at the Harvard Branch tells you the Co-op is a joke, or when some interested person tells you that the store has no advantage over the regular dealer so far as you are concerned tell them that you are a Tech man and hope to get a degree, and that you would be afraid to believe such stuff for fear the Faculty would hear about it and give you a double F on Intelligence.

THE NEW TECHNOLOGY

By A. F. BEMIS, M. I. T., '93

THE new buildings and equipment, with their most ideal setting, will undoubtedly put new life into all the eduactional features of Technology. The change from the old buildings to the new could hardly be more marked. Nevertheless, the most radical change will probably be found in the social and athletic life of the students under the new conditions.

In providing dormitories and opportunities for outdoor physical recreation, even though both may be somewhat limited in scope, the Institute is entering upon a new field. This entrance will not be made quickly enough to meet the full needs of the students, and it will probably be accompanied with mistakes. Nevertheless, these dormitories, the nearby athletic field, and the Walker Memorial will surely exert a beneficial influence upon undergraduate life at the Institute. The degree of the benefit will depend very largely upon the spirit and the actions of the undergraduates next year. Those who go into the dormitories must do so with the determination to make the life therein as ideal as possible, and as free as possible from evil influences. The opportunities for outdoor recreation which it may be possible to provide should be utilized to the full extent, and, likewise, the club and dining facilities of the Walker Memorial, and each student should be just as interested and determined upon the successful outcome of the first year in the new Technology as though it were his very own.

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All manuscripts submitted for publication in the TECHNOLOGY MONTHLY AND HARVARD ENGINEERING JOURNAL should be accompanied by the writer's full name and address. Manuscripts not accepted for publication will be returned only if the author so requests. Photographs, drawings, etc., will be returned to the contributor immediately after publication.

Forms close the 28th of the month immediately preceding date of publication. Material specially arranged for may be received up to the fifth day following.

EDITORIAL

SUMMER READING

TECH is a school to which the seriously-in-earnest young man turns for instruction in what he means shall be his life-work. This very, *very* often means that a young man has come forth from the mass because he has virility and the will to do things as compared with the young men who, because their fathers have means, are sent to schools like Princeton, Harvard and others, merely to be polished or "sand papered."

They generally come to Tech without the advantage of broad reading and information. They probably never had the time for that, even if they had the inclination. They often have parents who infrequently have had the opportunities to become themselves broadly cultured. The young men themselves begin their study of technical subjects with a more or less uneven mental development.

To help them overcome this handicap, a course of Summer Reading guided by capable men seems to me to be absolutely necessary.

The subjects should be chosen with a direct view to the provocation of the logical processes of independent thought. Too many young men find it necessary to ask somebody else to tell them what they think on any subject. They accept only too literally the dictum that "The powers that be are ordained of God," and that, therefore, the fellow who does think independently is a rebel and iconoclast, and of course that is "just awful."

The young man who doesn't learn to *really* think his own thoughts can hardly become a credit to the "Stute." This being made clear to the students' mind, it seems to me that only an ass would cheat himself of getting the most of his technical education by shirking the Summer Reading that is planned to qualify him to widen his intellectual horizon so he can make the most of the opportunities that may (if he is not an ass) become his after his training is completed.

The burden, therefore, is negligible. He must feed his body in summer, and he ought and will (not being an ass) feed his capacity to rise.

I believe that most students are honest with reference to their Summer Reading in the same ratio that they actually comprehend the importance of the "Why" that they ought to follow it as directed.

I suggest that it might be well to add to the list such books as William Morris' "Dream of John Ball," the introductory chapters of the several books of Blackstone's "Commentaries," the "Manifesto" of Karl Marx, and such others as will occur to the faculty—the purpose being partly to inform and partly to shock the student into attempting to mentally controvert past smug preconceptions, many of which are more likely than not, apt to be opposed to scientific progress. It is not necessary to imply that the Institute *necessarily* endorses the things read.

THE HONOR SYSTEM AND PROBLEM WORK

IT was also suggested that the system should be in effect throughout the whole year instead of merely during examinations. Under such a ruling, a student would be expected to refrain from using work which had been done by another who had previously done it and might have it on file." We quote the above form that issue of *The Tech* that contained the report of the "Honor System" meeting of the Institute Committee. We believe there should be added to this the words "or which has just, or is being done by another."

Many of the students at the Institute co-operate with one another in doing their outside preparation, at least when the same consists of problems. This includes, perhaps, a majority of this outside work. I ask the question, "How far can two or more students go in working together, and yet have their work entirely their own?"

I cannot see the least difference between a fellow copying work which has just been done, or is being done, and copying work which has been done a year or more. And here I mean copying rather than co-operation. Again, when does co-operation become copying?

It is an obvious fact that there are many men who turn in work that is entirely their own, and who are given low grades for this work, because the work is of a low standard. Also, there are men who turn in work that is partly or entirely the work of others, and who receive good marks for the excellent work turned in because the said students do not make the instructors acquainted with the fact that the work is not their own. *If you know where to look*, you can see groups of men with their heads together on the same problems. *Some* of the men in these groups are undoubtedly doing original work. Do *you* think they all are? Do *you* think these men are applying the Honor System to their work at present?

TECHNOLOGY'S FIFTIETH ANNIVERSARY

THERE are some opportunities which come only once in a lifetime. To partake in or witness such a spectacle as is presented by the All Technology Dedication and Reunion is one of these golden opportunities. This 50th birthday celebration is something which equals and surpasses any thing of its kind ever held, and many years will roll by before it is duplicated. The present generation can congratulate itself on its work and on it success; and the coming generations can rejoice over the new and extended chance placed before it.

Things have changed in the past and will continue to change in the future; progress is to be expected. The Old Institute had its place and played its part. The New Institute will take its place and continue the work placed before it, each year in a newer, broader and more progressive form. The future is bright, and the co-operative spirit of All Technology pauses only to repeat: "Let the Future exceed the Past."

A club to be known as *Frieze and Cornice* has been formed among the students of Course IV. The membership will be limited to the Faculty and the Senior Class.

HARVARD GRADUATE NOTES

'02—Gragg Richards and Huntington Adams, '01, are engaged in mining engineering in Antofagasta, Chile.

'14—W. N. MacGowan is with the Western Electric Co., Chicago. His address there is 301 West Side, Y. M. C. A.

'10—Minton M. Warren, until recently superintendent of the Lake Arigvonabo Co. in San Antonio de los Banos, Cuba, has returned to the Boston office of the Stone & Webster Engineering Corporation, 147 Milk Street, Boston

'11—John F. Gowen is with Smith, Hausen & MacIsaac, 18 East 41st St., New York.

'08—The business formerly conducted by Mason T. Rogers and Carlisle W. Burton under the name of M. T. Rogers & Co. has been transferred to the Burd Ring Sales Co. Their offices are at 810 Iroquois Building, Buffalo, N. Y., as formerly and they have branch offices in Pittsburgh, Rochester and Boston. E. B. Allen is manager of the Boston office at 899 Boylston Street.

'07—Paul D. Hawkins is in charge of the service department of the Framingham Machine Works, Framingham, Mass. His permanent address remains 68 Westland Ave., Boston.

'08—Everett N. Hutchins is an assistant engineer with the Directors of the Port of Boston.

'95—George Lawrence Smith is specializing in the planning of farm buildings. He has offices at 20 Central St., Boston, and 597 Fifth Ave., New York.

'03—Guy L. Jones is at the front in Mexico. Through a radio telegram it was learned that he was at Namiquipa on May 12.

HARVARD ENGINEERING SOCIETY OF NEW YORK

About 400 members and guests attended the third regular meeting of the Harvard Engineering Society of New York, at the Harvard Club, March 15. G. D. Wardrop, managing editor of the Aerial Age gave what was unanimously voted to be one of the most interesting lectures ever presented before the society on "The War in the Air." The lecture was illustrated with stereopticon views and moving pictures of aeroplanes and dirigibles in action.

On April 21 about 40 members and guests visited the storage-battery department of the Edison Company at West Orange, N. J., and were shown over the work by specially assigned guides. The annual business meeting was held in the evening at the Harvard Club. Ralph R. Rumery, '99, gave a short talk on "The Valuation and Regulation of Public Utilities."

The officers elected for the coming year are as follows: President, Charles Gilman, '04; vice-president, Warren Delano, '74; secretary, Clifford M. Holland, '05; treasurer, Thomas C. Desmond, '08; members of the executive committee, Sidney J. Jennings, '85, Henry Goldmark, '78, James F. Sanborn, '90, Ralph W. Greenlaw, '02, J. P. H. Perry, '03, W. Standish Nichols, '03, and Edric B. Smith, '08, together with the president, vice-president, secretary, treasurer, and past-presidents J. R. Finlay, '91, Thomas Crimmins, '00 and Clifford Richardson, '77, ex-officio.

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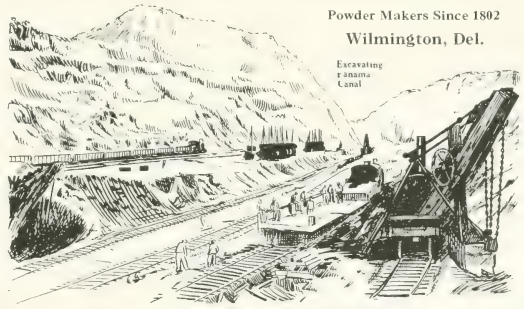

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"But I haven't performed any deed of heroism."

"But you will when you give up twenty-five cents."—New York World.

WELL PICKED

Aunt—"Your bride, my dear boy, is wealthy and all that, but I don't think she'll make much of a beauty show at the altar."

Nephew—"You don't, eh? Just wait till you see her with the bridesmaids she has selected."—Nashville Tennessean.

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THE TWENTY-THIRD PSALM FOR PHYSICAL CHEMISTS

The phase rule has my goat, I shall not want another.
It maketh me to see things queerly.
It trieth my patience.
It leadeth me in the paths of ridicule for my instructor's sake.
Yea, though I wade through the volumes, I am no nearer the end.
And I fear much evil, for the components and eutectics discomforteth me.
I anoint thy triple joints with the sweat of my brow. Thy degrees of freedom are as a penitentiary.
I prepare for examinations by making out a cribb.
Surely, if this thing follows me all the days of my life I shall dwell in the bug-house forever.—Cornell Chemist.

CLOSE WORK

The Irish Republic lasted just long enough to enable "The Fatherland" to get in a demand that the United States recognize it.

"The rain broke up the Preparedness Parade, didn't it?"

"Yes. Nobody thought to bring an umbrella."—Lampoon.

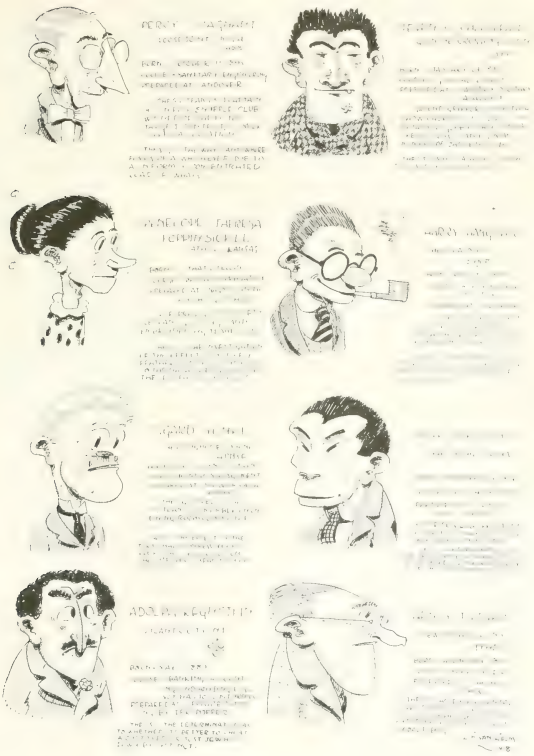
The Sargeant—"Now, my men, fight like heroes until your powder is gone, then run for your lives. As I am a little lame, I'll start now."—Awgwan.

Automobile Enthusiast—"That car of mine climbs hills like a mountain goat!"

Cynic—"Yes, I've often noticed how it skips."—Record.

NEW WAYS TO RUN THE TECHNIQUE RUSH

Editor's Note. Suggested after receiving letters of criticism concerning the last Rush.



THE MONTHLY'S SENIOR PORTFOLIO

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It is a fundamental of Weston policy that every instrument must be capable of accuracy far in excess of its guaranteed performance. Instrument transformers—and especially the portable models—must necessarily be designed and made with a much greater degree of refinement than is necessary in commercial lighting and power transformers of which only ordinary accuracy is required.

With the determination to make every model of Weston Instrument the most efficient and reliable in its class, we have devoted several years of the most exhaustive analytical study and experimental investigation to the perfecting of Portable Instrument Transformers.

This work has involved the devising of new methods of measurement and the construction of special instruments to ascertain by the highest degree of precision the various factors which affect the performance of Instrument Transformers. The enormous amount of study and experiment has been amply justified by the wonderful results presented in these Weston Transformers. We can recommend them thoroughly. In every respect they maintain the exacting Weston standard of quality.

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Lady (to an agent)—"Do you sell invisible hairpins?"

Agent—"Yes, ma'am."

Lady—"Well, let me see some."—Burr.

"Say, Bill, how did the game come out?"

"It ended in a tie."

"Oh, were you playing strip poker?"—Burr.

"I see that the English struck a terrible blow at the enemy."

"Is that so? What did they say?"—Judge's Lantern.

TOO SMOOTH

"Mr. Sinnik is very polished, isn't he?"

"Very! Everything he says reflects on someone."—Transcript.

SOCIAL UP LIFT

"I'm asking a raise," said my pretty stenog.:
"For I'm planning a regular spree."
"Very well," was my answer, "I'm never a hog,"
And I raised her right up to my knee.—Cornell Widow.

Some girls can't even wear an air of innocence without making it suspicious.—Life.

AFTER THE WOMEN'S TRACK MEET

Her—"You ought to have seen Mabel run the quarter mile."

It—"What did she make it in?"

Her—"I don't know what you call the damned things."—Cornell Widow.

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I DIDN'T RAISE MY BOY TO BE A CHEMIST

(To the air "I Didn't Raise My Boy to be a Soldier," with apologies)

I didn't raise my boy to be a chemist,
I brought him up to be my pride and joy.
Who dares to place an apron 'round his shoulder,
And make such smells for mother's darling boy?
Let carbon have no asymetric atoms,
It's time to throw the benzine ring away.
There'll be no h—l to pay
If mothers would only say,
I didn't raise my boy to be a chemist.

—Lenzing, '16, in Illinois Chemist.

You say she was hard hit?

Why, yes, she took the Count.—Record.

NO HOPE

Edith—"Haven't you and Jack been engaged long enough to get married?"

Ethel—"Too long! He hasn't got a cent left."—Boston Transcript.

Professor's Wife—"I need a new hat, dear."

Professor—"All right. I'll have the students buy some of my text books."—Cornell Widow.

"Johnnie, you don't have to bring in the wood; father is coming home with a load."—Awgwan.

"Have you been gymming, Bertie?"

"Yeth; and getting stwong. Cwan't woll a cigarwette now without breaking the papah."

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Why does Missouri stand at the head in raising mules?

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Wordupois—"I'll bet you five plunks that I can run around that track in less than a minute. Has anyone here a stop watch?"

Wise—"You mean you want a stop-watch. Hey! Who's got a calendar?"—Burr.

Lanette—"I think Estelle would be pretty if it were not for her Roman nose."

Nanette—"Roman nose?"

Lanette—"Why, yes; it roams all over her face."—The Lehigh Burr.

AT THE PROM

He (noticing his partner isn't talking much)—"You seem to be intellectually fatigued."

She (absently)—"My feet hurt terribly."—The Lehigh Burr.

DO YOU MEAN TO INSINUATE?

Riled Young Lady—"I wish you would stay off my feet."

Sarcastic Partner—"Do you want me to get off the floor?"—The Lehigh Burr.

"See here, aren't you the same man I gave a biscuit to last week?"

"No, lady. De doctor says I'll never be the same man!"—Browning's Magazine.

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"I smell gas."

"It's all right. The prof. is still talking."—Jester.

Junior—"Did you see the beautiful sun rise this morning?"

Senior—"No, I always go to bed before sunrise."—Penn Punch Bowl.

She (when he is unable to throw his clutch out)—"What's the matter, Tom?"

He—"Something is wrong with the transmission."

She—"Oh, dear, do you think it will show?"—Siren.

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Behind your bond there must be excellent security--an instrument would be no good to you if it merely served today and tomorrow broke down, and failing to hold its adjustments gave inaccurate readings.

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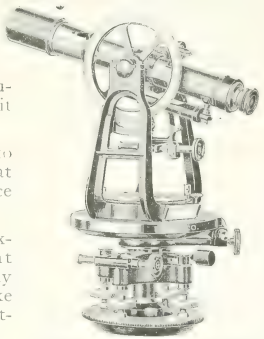

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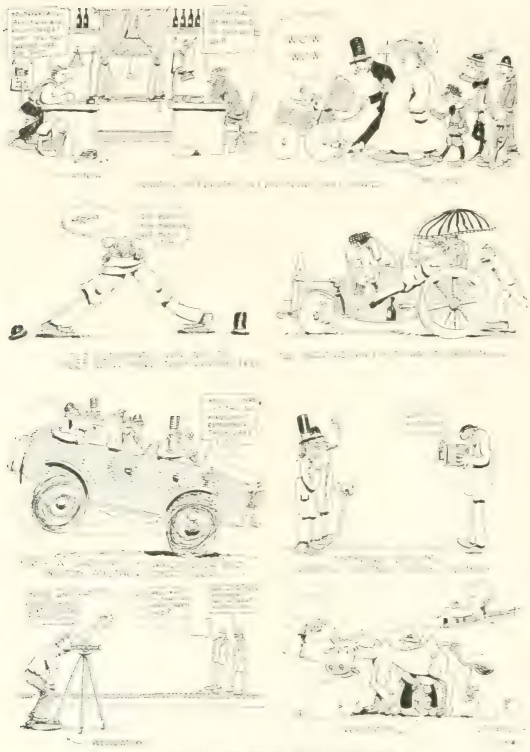
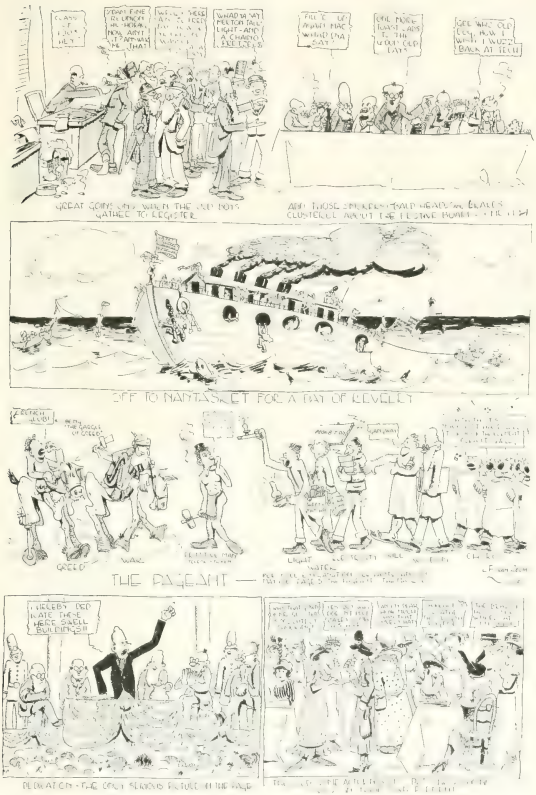


ODDS AND ENDS OF REUNION WEEK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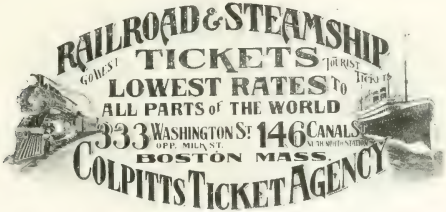

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